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PRESERVATION OF EQUILIBRIUM IN ORTHOGRADE AND INVERTED BODY POSITIONS

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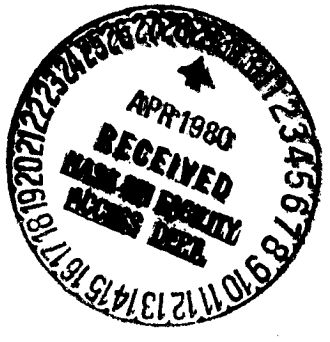
Translation of "O sokhranenii ravnovesiya v ortogradnom in perevernutom polozhenii tela", Teoriya i Praktika Fizicheskoy Kultura, No. 5, May 1979, pp 29-30



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16. Abstract

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PRESERVATION OF EQUILIBRIUM IN ORTHOGRADE AND INVERTED BODY POSITIONS

By

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The support function of the human organism in correlation to the visual, /29* vestibular, auditory and tactile provides the biophysical contact in the system "man-environment" and is realized in movements and poses. Retention of the orthograde pose of man is attained by means of the coordinate activity of a large complex of functional systems that organize and regulate the adaptive behavior, during which individually-customary stereotype of pose-tonic reactions is formed.

The entire diversity of athletic movements includes components of pose equilibriums in different body positions. Specific difficulties that arise in the process of execution of pose equilibriums in the inverted, horizontal and inclined body positions raise new tasks in the study and understanding of a number of functional mechanisms that guarantee the optimal interaction between man and the environment.

This experimental work proposed detecting the features in the mechanism for regulation of the vertical pose with retention of equilibrium in the inverted body position. In this respect the features of regulation of a stable body position in a headstand were investigated. In the selection of the research technique we were guided by the fact that regulation of the vertical pose unambiguously and specifically reflects the degree of interrelationship between man and other structural components of the environmental system (support, space, their change)and provides material for an analysis of the microstructure of the given

*Numbers in margin indicate pagination in original foreign text.

function in the form of a pattern of oscillations of the body above the support area, recorded by the method of stabilography.

A study was made of 57 gymnasts of the senior classes (masters of sports and candidates for master) 17-20 years old (27 women and 30 men). The experimental program envisaged fulfillment of exercises mastered sufficiently by the subjects: retention of vertical equilibrium on one leg, the other bent towards the knee of support, hands on waist, and retention standing on hands. The exercises were performed on a stabilographic platform.

In the comparison of the different experimental exercises constructed with regard for the body position and the support position an analysis was made of the dynamics of oscillations in the body and the quantitative indices of the stabilographic indices.

Comparison of the "handwriting" of the oscillating body movements expressed in the figure of the stabilographic curves indicated that regardless of the sex of the subjects the manifestations of the tactics of the regulatory mechanisms that

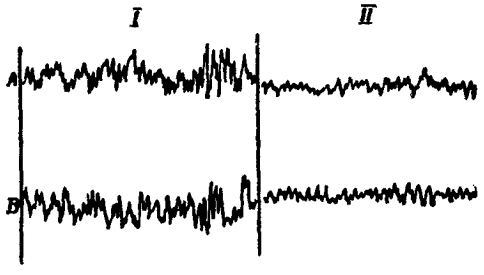

Figure 1. Stabilograms of Fufillment of Equilibrium on One Leg in Men (A) and Women (B) in Sagittal (I) and in Frontal (II) Planes

guarantee preservation are diverse and bear a clearly pronounced individual nature both in the orthograde and in the inverted body positions. The tactics of regulation of pose in equilibrium on one leg in women, in contrast to men, has a more ordered nature, which is expressed in the lower amplitude of oscillations both in the sagittal and in the frontal planes (fig. 1). As for a comparison of the stabilographic data of subjects of both sexes in headstands, here such a law was not revealed. One can hypothesize that the tactics of regulation of the gymnasts' pose in the orthograde position was positively influenced by the mastery of a large number of exercises in equilibrium, which is linked to the specific nature of

work on the beam.

In a comparison of the stabilographic data in equilibrium on one leg and on hands no significant differences were found in the quality of pose regulation. The individual stabilographic "handwriting" in the inverted body position was not altered in principle, there were only quantitative changes in the stabilographic indices (fig. 2). The quantitative indices of the stabilograms were increased in the inverted body position in all cases.

Figure 2. Stabilograms of Execution of Equilibrium in Headstand (I) and on One Leg (II) in Men Gymnasts (A) and Women Gymnasts (B).

Correlation analysis of the quantitative characteristics of the stabilographic indices for retention of equilibrium on legs and on hands indicated the presence of an interrelationship between the maximum and the average amplitudes and frequencies of body oscillations in headstands in the sagittal plane and in equilibrium on one leg in the frontal plane (see table).

Such a "crossed" and not parallel relationship of the stabilographic indices /30 is evidently explained by the fact that the greatest probability for loss of equilibrium with retention of headstands is in the sagittal plane, and with retention of equilibrium on one leg (in our case)--in the frontal plane.

In analyzing the quantitative indices of the stabilograms one can draw the conclusion that the subjects with the lowest amplitude of body oscillations with retention of equilibrium on one leg have also in the headstands a comparatively small amplitude of oscillations. And vice versa: the large amplitude of body oscillations with retention of equilibrium on one leg and in headstands is inherent to the same gymnasts. If one takes into account that with an increase in stability there is a decrease in the amplitude of body oscillations in the pose equilibriums, then we are justified in drawing the conclusion that the capacities for preservation of a stable position in the orthograde and inverted body positions are interrelated.

CORRELATIONS BETWEEN STABILOGRAPHIC INDICES OF BODY OSCILLATIONS IN EQUILIBRIUM ON ONE LEG AND IN HEADSTANDS

One leg \ On hands		Sex	In sagittal plane			In frontal plane		
			Am	F	Aa	Am	F	Aa
In sagittal plane	Am	M	0,279			0,566*		
		F	0,270			0,817*		
	F	M		0,043			0,583*	
		F		0,077			0,794	
	Aa	M			0,177			0,573*
		F			0,123			0,733*
In frontal plane	Am	M	0,651*			0,078		
		F	0,830*			0,033		
	F	M		0,658*			0,120	
		F		0,751*			0,200	
	Aa	M			0,730*			0,283
		F			0,645*			0,178

Notes: *--correlation coefficients are reliable ($d < 0.01$). Am--maximum amplitude of oscillations. F--frequency of oscillations. Aa--average amplitude of oscillations.

Preservation of the individual stabilographic "handwriting" in the inverted body position provides the grounds to conclude that the sensory action in response to the change in body position and support is organized with the use of certain tactics. Regulation of the pose activity is accomplished modelwise with the help of the same techniques.